



The PV LED Engine - a new generation of intelligent solar powered LED lighting

Poulsen, Peter Behrendorff; Thorsteinsson, Sune

Publication date:
2015

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Poulsen, P. B., & Thorsteinsson, S. (2015). *The PV LED Engine - a new generation of intelligent solar powered LED lighting*. Abstract from Danish Opening Ceremony of the International Year of Light, Lyngby, Denmark.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

The PV LED Engine – a new generation of intelligent solar powered LED lighting

P B. Poulsen^{1,*}, S. Thorsteinsson¹, and J. Lindén¹

¹Department of Photonic Engineering, Frederiksborgvej 399 Roskilde, Denmark

*E-mail: ppou@fotonik.dtu.dk

Abstract— A barrier for exploiting use of standalone solar lighting for the urban environment seem to be lack of knowledge and lack of available tools for proper dimensioning and positioning. This work presents such a tool.

Keywords— PV urban lighting, Energy systems, standalone, LED lighting, Light-2-Light

I. INTRODUCTION

Digging down cables for small electrical applications in the urban environment is extremely expensive due to the high labor cost associated with it. Small stand-alone PV applications powered by 0.5-50 Wp can become very attractive since e.g. in Copenhagen in Denmark the cost of digging down cables in the city is about 1000 \$ pr. running meter so the cost savings on the cable digging can easily pay for the solar cells and electronics. The requirements to the products from the municipalities are high so if e.g. the products are for lighting purpose the reliability of the product meeting some specified amount of light is very important. The barrier for exploiting this potential seems to be the lack of knowledge and tools for dimensioning and designing PV applications for the urban environments. The authors investigated the many PV dimensioning tools on the market and found none addressing exactly this issue and in the present project a design and simulation tool for small PV applications for the urban environment has been developed along with characterization facilities able to characterize the individual components of the system: Solar panel, Battery, Electronics and LED/Luminaire.

II. FIGURES AND TABLES

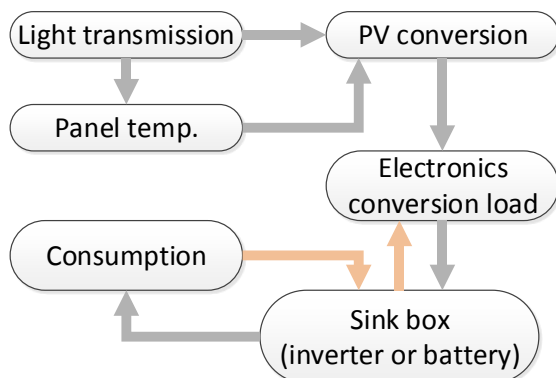


Fig. 1. Block diagram of the PV simulation tool.



Fig. 2. BIKE-LIGHT – solar lighting product for Copenhagen.

III. SUMMARY

A time resolved dimensioning tool schematically shown in figure 1 is developed that uses measured parameters of the individual components in the PV Lighting system for the simulations: PV, Battery, Electronics and LED/Luminaire. The tool uses time resolved solar irradiation data (1 minutes – 60 minutes resolution) separated in diffuse and direct irradiation to calculate the dynamic energy harvesting of the solar panels in the product (eg. BIKE-LIGHT shown in figure 2). An attenuation function based on the measured or simulated shading environment of the product is used to simulate the energy harvesting. Due to the dynamic behavior with different irradiation levels of the PV and lighting levels of the LEDs both the energy harvesting and lighting scheme of the product is modelled time resolved and dynamically to achieve the most lifelike prediction of the product performance to be able to dimension the product perfectly for the given application.

ACKNOWLEDGMENT

The project is funded by the Danish Energy Technology Development and Demonstration Programme, project number 64011-0323, “The PV LED Engine - new generation of intelligent solar powered LED lighting”.